CELL-STATE TRANSITIONS IN THE DIATOM *THALASSIOSIRA PSEUDONANA* DURING DIURNAL GROWTH

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Diatoms are important primary producers in marine ecosystems whose success depends on the regulation of their physiological states under changing environments. We have conducted a genome-wide survey of the diatom *Thalassiosira pseudonana* during growth at two moderate CO_2 levels. This reveals large, reproducible cell-state transitions between four principal conditions: I) exponential and nutrient replete, II) stationary and nutrient depleted, III) dark and IV) light phases of growth. Here we present a gene-level characterization of these physiological modes, including patterns of differential expression in metabolism, nutrient assimilation, and multiple levels of cellular regulation (transcription factors, chromatin modifying enzymes, and signaling and sensory proteins). The co-expression of thousands of known and unknown genes of under specific physiological and environmental contexts provides clues into their functions and biological regulation. This is important for the diatom clade, in which most of the genes that are predicted and expressed are of unknown function. Physiological states and transitions that are consistent at both ambient and elevated pCO_2 are relevant to diatom ecophysiology in a changing climate, and will facilitate further annotation, hypothesis generation, and the interpretation of data collected in the field.